REMARKS

The outstanding Office Action has been studied carefully and by the present amendments and remarks an earnest attempt is being made to place the subject application in condition for immediate allowance. No new issues are raised that would require a further search and the Examiner is respectfully requested to enter and consider the amendments and remarks set forth herein. Accordingly, reconsideration of this application is respectfully requested.

Claims 1-25 are pending in the subject application. Of those claims, claims 1-6 and 9-25 are rejected under 35 U.S.C. Section 103(a) as being unpatenable over U.S. Patent 5,972,424 to Draghi et al. (Draghi) in view of U.S. Patent 6,049,978 to Arnold (Arnold) and U.S. Patent 5,851,424 to Schaeffer et al. (Schaeffer). Similarly, claims 7-8 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over Draghi in view of Arnold as applied to claims 1-6 and 9-25, and further in view of U.S. Patent 6,575,702 to Jackson (Jackson).

The foregoing rejections are respectfully disagreed with and are traversed below.

Independent claims 1, 19 and 25 are directed to a method for restoring adjacent airfoil to airfoil throat distance, wherein the airfoil to airfoil throat distance is restored to about the distance preceding the engine run without use of excess coating that must be removed so that the dimensions of the coated component are restored to about the coated dimensions preceding the engine run to increase subsequent engine operation efficiency without a weight penalty.

As disclosed in the subject specification at page 4, Applicants have determined that if conventional processes are used in repair, the original or pre-repair coated airfoil section dimensions are not restored and thus blade to blade throat distances (distance between adjacent airfoil sections in an engine) increase. Applicants also have determined that such changes in airfoil dimension may substantially affect turbine efficiency. As further disclosed at page 6 of the specification and shown in Fig. 3, Applicants have determined how to compensate for base metal loss as a result of coating removal processes, and also restore airfoil section contour to its pre-repair or original coated airfoil contour dimensions, without a

weight penalty. For instance, as disclosed at pages 14-15, the weight/thickness margin remaining may be used to determine the thickness in which to apply the ceramic thermal barrier coating in order to restore the airfoil dimensions without suffering a weight penalty. Advantageously, the newly coated component employing Applicants' overlay bond coat 21 has the restored dimensions to meet the original aerodynamic intent of the part, as shown in Fig. 3 and described at page 17, and does not suffer a weight penalty.

Thus, as also described at page 4 of the specification, an important advantage of embodiments of the invention is that resulting airfoil throat area restoration will allow the turbine to run much more efficiently. For example, during conventional repair of an engine run component, about 3 mils of underlying base metal thickness may be removed in the process. Thus, about a 3 mil loss of base metal may be experienced on both the pressure and suction side of an airfoil, which translates into about a 6 mil increase in throat dimension (distance between adjacent airfoil sections in an engine). While this increase in gap between the components may not adversely affect the mechanical operation of the engine, Applicants have determined that operation efficiency may be substantially adversely affected. Embodiments of Applicants' invention present an innovative, much needed solution to the above problem, which is inexpensive to implement and does not require additional costly equipment.

Applicants respectfully assert that none of the cited references disclose or suggest the presently claimed method including all of the steps recited therein, whether viewed alone or in any combination. In particular, the primary reference, Draghi, is merely directed to the repair of a gas turbine engine component using a flash coating. According to Draghi, the part is inspected to "ensure that sufficient bond coat 12 remains to perform the repair ..." (Col. 4, lines 16-20). "If there is insufficient bond coat 12, the blade 18 may not be repaired with the method of [Draghi]." (Col. 4, lines 20-30).

In contrast, Applicants' independent claims 1, 19 and 25 require "removing the thermal barrier coating system," which includes a bond coat and a top ceramic coating, and applying a beta phase NiAl overlay coating to the substrate. Thus, the method of Draghi teaches away

from the present claims and one skilled in the art seeking to develop such a repair process would not even be motivated to look to Draghi for guidance nor even combine it with any other reference.

Moreover, the Patent Office asserts at pages 8-9 of the Action that "Draghi teaches that it is desirable to 'repair thermal barrier coated parts periodically to restore them to desirable conditions (Column 1, lines 44-46). Restoring the coated parts to desirable conditions inherently teaches of restoring the component to its original state, ie dimensions, thereby increasing the operation efficiency." Applicants respectfully disagree and point out that "desirable conditions" as used in Draghi does not equal restoration to prior airfoil dimensions. As described above, this is a problem in the art solved by the presently claimed invention. In conventional repair processes, as described in Applicants' specification, original dimensions are not restored as the thermal barrier coating is applied to its original specification/thickness, which has been carefully determined. After a number of repairs, however, the part may become too thin and thus not meet minimum design requirements. Applicants have solved the problem of how to particularly restore and maintain adjacent airfoil to airfoil throat distance while maintaining efficiency without a weight penalty. Draghi is not concerned with such a problem, and one skilled in the art would not be motivated to look to Draghi and then modify its teachings in an attempt to arrive at the present claims.

Draghi merely teaches at col. 1, lines 57-65, that a thinner wall is acceptable as long as it meets applicable inspection criteria. Thus, desirable conditions, according to Draghi, would include such a thinner component. Draghi does not conduct any measurements or perform any calculations to rebuilt and restore adjacent airfoil to airfoil throat dimensions to those preceding an engine run to increase subsequent engine operation efficiency without a weight penalty. Nor does Draghi even restore the coated dimensions of the component as required by all of Applicants' claims. Draghi merely applies a flash coating in an attempt to increase the number of times a part can be repaired.

Moreover, Draghi does not i) determine thickness of removed base metal substrate as set forth in Applicants' step b), ii) does not apply a beta phase NiAl overlay coating to the

substrate and determine the difference in thickness between the beta phase NiAl overlay coating and previously removed bond coat as set forth in step c), and iii) does not reapply a top ceramic thermal barrier coating according to the equation set forth in Applicants' independent claims, wherein coated airfoil contour dimensions are restored to about the coated dimensions preceding an engine run. Draghi is not at all concerned with restoring adjacent airfoil to airfoil throat distance to about the distance preceding an engine run without use of excess coating that must be subsequently removed so that the dimensions of the coated component are restored to about the coated dimensions preceding the engine run to increase subsequent engine operation efficiency without a weight penalty.

The addition of Arnold, Schaeffer and/or Jackson does not cure the shortcomings of Draghi for at least the following reasons. Arnold is directed to a multi-step repair method where an "HVOF plasma spray material is applied so as to build up a cordal dimension of the engine part to a thickness greater than the thickness of an original cordal dimension of the engine part." (Col. 8, lines 37-40). This process is followed by sintering, hot isostatic pressing and finally "the engine part is machined, ground and/or polished to the original or desired dimensions." (Col. 8, lines 37-51).

On pages 4-5 of the Office Action, the Patent Office states that any "equation Arnold uses to determine how much build-up thickness to use will require the same '$t+\Delta x-\Delta x$' analysis required by Applicant and inherent in Draghi's teachings." Applicants respectfully disagree. Applicants do not employ such an excess of coating as in Arnold that must be subsequently ground off and removed. To the contrary, Applicants' claimed invention advantageously restores adjacent airfoil to airfoil throat distance to about the distance preceding the engine run without use of excess coating that must be subsequently removed so that the dimensions of the coated component are restored to about the coated dimensions preceding the engine run to increase subsequent engine operation efficiency without a weight penalty.

Accordingly, Applicants assert that Arnold teaches away from the claimed invention. One skilled in the art seeking to develop the claimed invention would not even be motivated to look to Arnold for guidance nor even combine it with Draghi.

Lastly, Schaeffer was cited as merely disclosing known NiAl bond coats and Jackson as teaching single crystal or directionally solidified alloys.

Applicants respectfully assert that there is no teaching, suggestion or motivation that would lead one of ordinary skill in the art to combine and then modify the teachings of the cited references in an attempt to arrive at the present claims. Without such a teaching or suggestion, the invention may only be considered obvious in hindsight, which is an improper basis for rejection.

For at least the reasons set forth above, independent claims 1, 19 and 25 should be found to be allowable. In that these independent claims are in condition for allowance, then claims 2-18 and 20-24 should also be found to be allowable in view of their dependence from an allowable independent claim.

All issues raised by the Examiner having been addressed, the subject patent application is believed to be in condition for immediate allowance. Accordingly, the Examiner is respectfully requested to reconsider and remove all of the outstanding rejections and to pass this patent application to issuance.

A call to the undersigned attorney at the telephone number listed below would be appreciated should the Examiner have any questions or believe that a discussion would advance the prosecution of the application.

Respectfully submitted:

Christine Wilkes Beninati 1/3/05

Christine Wilkes Beninati Date

Reg. No.: 37, 967

Customer No.: 29683

HARRINGTON & SMITH, LLP

4 Research Drive
Shelton, CT 06484-6212

Telephone: (203)925-9400 (Ext. 17)
Facsimile: (203)944-0245
email: cbeninati@hspatent.com

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. BOX 1450, Mail Stop AF Alexandria, VA 22313-1450.

1/3/2005 Elaine F. Mann

Date Name of Person Making Deposit

IN THE DRAWINGS:

Please replace sheet 1 of 2 with the attached Replacement Sheet. This Replacement Sheet corrects a typographical error with respect to reference numeral 18. In Fig. 1, reference numeral 18 for the cooling holes is corrected to 18', as reference 18 refers to the thermal barrier coating system (see Fig. 2).